

fig 5-6 - election #7



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w/o HDP

language of no HDP

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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Paper No. 17

Application Number: 09/470,650

Filing Date: December 22, 1999

Appellant(s): FIGURA ET AL.

Charles Brantley
For Appellant

- 1995 does not meet

112, IP1

SAVE

USC 120

EXAMINER'S ANSWER

This is in response to the appeal brief filed 3/27/03.

(1) *Real Party in Interest*

A statement identifying the real party in interest is contained in the brief.

(2) *Related Appeals and Interferences*

A statement identifying the related appeals and interferences, which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) *Status of Claims*

The statement of the status of the claims contained in the brief is correct.

(4) *Status of Amendments After Final*

No amendment after final has been filed.

(5) *Summary of Invention*

The summary of invention contained in the brief is correct.

(6) *Issues*

The appellant's statement of the issues in the brief is correct.

(7) *Grouping of Claims*

The appellant's statement in the brief that certain claims do not stand or fall together is not agreed with because the applicant has repeated some claims in different grouping. A more appropriate grouping would be:

Group I: Claims 1-6, 14, 24, 29-32, and 39

polymer in HDP

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Group II: Claims 7-8, 10-13, 19, 23, 36-38, and 40-43.

na HDP

Applicant's grouping of claims cannot overlap.

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

5,562,801	NULTY	10-1996
5,804,259	ROBLES	9-1998

John Arnold, "Diagnostic Investigation of Oxide etching in a commercial high-density plasma etcher", The American Physical Society, 10/21/96.

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

35 U.S.C. 112 rejections withdrawn.

Claims 1-3, 7, 13, and 36-38 are rejected under 35 U.S.C. 102. This rejection is set forth in prior Office Action, Paper No. 14.

Claims 4-6, 8, 10-12, 19, 23-24, 29-32, and 39-43 are rejected under 35 U.S.C. 103. This rejection is set forth in prior Office Action, Paper No. 14.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Applicant's specification for the great-grandparent application 08/458,861 in 1995 does not support "forming a polymer" in a high-density plasma environment. Applicant points out in a selection on pg. 5 lines 17-18 and pg. 6 lines 13-14 where the formation of a polymer is a byproduct of etching. Applicants do not teach the steps of forming a polymer in the high-density plasma environment. Applicants cite that a layer may form at a broad range of settings while etching. The 1995 specification mentions the HDP etcher only twice in its specification. Furthermore, the 1995 specification mentions other types of etchers such as a conventional plasma etcher, a LAM TCP model, or other such etcher (pg. 6, lines 13-14). The 1995 specification does not teach polymer deposition. The 1995 specification does not teach polymer deposition using a HDP etcher. The 1995 specification only provides supports for a polymer being a byproduct of etching. It is unclear from the 1995 specification which type of etcher is used to etch. Even if the 1995 specification read on a HDP etcher apparatus, the 1995 does not disclose polymer formation in a high-density plasma environment. Therefore, the process of forming a polymer in a high-density environment was not described or enabled.

For the reasons given above, the applicant is not given the priority date of 06/2/95 for the great-grandparent application 08/458,861 under 35 U.S.C. 120 for claims 1-6, 14, 24, 29-32, 39. Those claims receive the priority date of 1/22/97 at which time one of ordinary skill would have known how to use HDP for polymer deposition from the reference Nulty (5,562,801). Claims 7-8, 10-13, 19, 23, 36-8, 40-43 receive the priority date of 06/2/95 for the great-grandparent application 08/458,861.



Claims 1-3, 7, 13, 36-38 are rejected under 35 U.S.C. 102(b) as being anticipated by John Arnold ("Diagnostic Investigation of Oxide Etching in a Commercial High-Density Plasma Etcher", 49th Annual Gaseous Electronics Conference Meeting Program, 10/21/96). Arnold discloses in the abstract forming a polymer in a high-density plasma environment (lines 3-9).

Arnold discloses wherein said step of modifying said polymer further comprises etching a portion of said polymer (line 9).

The method of Arnold has a step of etching a portion of said polymer, which is inherently part of a first and second metallic feature.

Arnold discloses providing a high-density plasma etcher with a plurality of process settings (lines 6-9).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 4-6, 8, 10-12, 19, 23-24, 29-32, 39-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arnold in view of Nulty (5,562,801). Arnold teaches forming a polymer between a first feature and second feature in a HDP environment (abstract). However, Arnold does not teach wherein plasma-depositing a material comprising carbon and a halogen. However Nulty teaches in fig. 10a, 10b, 11 plasma depositing a material (fig. 10a-b) comprising carbon and a halogen (col. 11 lines

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19-20, col. 12 lines 13-15). Therefore it would be obvious to one skilled in the art at the time of invention to modify the process of Arnold to plasma-deposit a material comprising carbon and a halogen in order to improve oxide/nitride selectivity.

Arnold teaches forming a polymer by HDP. However, Arnold does not teach wherein plasma-depositing a halogen-free material. However, Nulty teaches wherein plasma-depositing a halogen-free material (col. 3 lines 43-48, col. 15 lines 20-25).

Therefore it would be obvious to one skilled in the art at the time of invention to modify the process of Arnold to plasma-deposit a halogen-free material in order to increase polymer formation.

Arnold teaches forming a polymer by HDP. However Arnold does not teach providing a semiconductor device having at least two exposed metal lines. However Nulty teaches at least two exposed metal lines (505, 1105, col. 6 lines 50-55, col. 10 lines 30-35). Therefore it would be obvious to one skilled in the art at the time of invention to modify the process of Arnold to provide a device with at least two exposed metal lines in order to vary thickness and etch rate of the two exposed metal lines.

Arnold teaches forming a polymer by HDP. However Arnold does not teach performing a process on said semiconductor device, wherein said process is defined by a plurality of parameters. However Nulty teaches a plurality of parameters, comprising: a source power magnitude, a bias power magnitude, a pressure, duration, and a process gas flow rate (col. 1 lines 58-65). Therefore it would be obvious to one skilled in the art at the time of invention to modify the process of Arnold by having a plurality of process settings in order to achieve the desired etch characteristics.

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Claims 1-6, 14, 24, 29-32, 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Robles (5,804,259).

In re claim 1, Robles discloses a method of forming a semiconductor device comprising: providing a surface within the device, providing a first feature on the surface, providing a second feature on the surface, and forming a polymer between the first and second feature in HDP environment (abstract).

In re claim 2 and 14, Robles discloses modifying said polymer within said HDP (col. 16 lines 49-65).

In re claim 3, Robles discloses that the step of modifying said polymer further comprises etching a portion of said polymer (col. 16 lines 41-45).

In re claims 4 & 5, Robles discloses that the first and second feature comprises of metallic feature or metal (col. 16 lines 1-10).

In re claim 6, Robles discloses that the first feature is a first metal line and the second feature is a second metal line (col. 16 lines 1-10).

In re claim 24 with the limitations of claim 23, Robles discloses providing a HDP etcher (col. 9 lines 42-45).

In re claim 29, Robles discloses a method of selectively forming a polymer by providing a device with exposed protruding features; providing an etcher having HDP settings comprising of: a source power setting, a bias power setting and a flow rate setting and exposing said device to a HDP process within said etcher (fig. 1 & 2, col. 9 lines 50-60 col. 16 lines 40-47).

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In re claim 30, Robles discloses defining at least one recess, filling said recess with said polymer, and restricting formation of said polymer to within said recess (col. 16 lines 40-47).

In re claim 31, Robles discloses that at least one recess with said features comprises defining a recess between 2 protruding features of said plurality of protruding features (fig. 7a/7b).

In re claim 32, Robles discloses step of restricting formation of said polymer to within said recess further comprises preventing a formation of said polymer above said 2 protruding features (ref. 410).

In re claim 39, Robles discloses providing a HDP plasma and forming a polymer between metal lines (claim 1, fig. 7a).

(11) Response to Argument

Applicant's arguments filed 3/27/03 have been fully considered but they are not persuasive.

A. 35 U.S.C. §112

The §112 rejection is withdrawn because this application has not received priority for polymer formation by HDP. The §112 rejection was given if priority was granted (paper #14: pg. 2, lines 15-16). However, this rejection is moot because priority for claims 1-6, 14, 24, 29-32, 39 is not granted for the priority date of 06/2/95 of the great-grandparent application 08/458,861 under 35 U.S.C. 120. Nevertheless, the following explanations are provided for the points that the applicants raised.

✓

Applicant's representative argues that the examiner admitted that the formation of a polymer is described in the great-grandparent application 08/458,461. Then, the applicant's representative assumes that polymer formation by etching is the same as polymer formation by HDP. This argument is not persuasive for eight reasons. First, the examiner admitted that the formation of a polymer was due to etching, not high-density plasma polymerization (paper #14: pg. 2, lines 3-4). Second, the formation of a polymer by etching and HDP are two different processes. Third, the great-grandparent ("1995 specification") only mentions a HDP etcher twice in the entire 25-page specification (pg. 5, lines 17-18; pg. 6, lines 13-14). Fourth, the 1995 specification — *doesn't connect* mentions other types of etchers such as a conventional plasma etcher, a LAM TCP model, or other such etcher (pg. 6, lines 13-14). Fifth, the claims in the great-grandparent do not read on HDP polymerization. Sixth, the 1995 specification only — *clearly hinders it* provides support for a polymer being a byproduct of etching (paper #14: pg. 2, lines 3-4). Seventh, the 1995 specification fails to indicate which type of etcher is used to etch (pg. 6, lines 13-14). Eighth, even if the 1995 specification read on a HDP etcher apparatus, the 1995 specification is silent on forming a polymer by HDP. Therefore, the process of forming a polymer in a high-density environment was not described or enabled in the 1995 specification. Thus, the instant application does not receive priority to the great-grandparent, filed in 1995.

Applicant's representative argues that not all of the claims include high-density plasma limitations, specifically claims 7-13, 19, 23-24, 36-38, and 40-43. Applicant should note that in paper #14 claims 7-8, 10-13, 19, 23, 36-38, and 40-43 receive the

priority date of 06/02/95 for the great-grandparent application (paper #14: pg. 2, lines 13-14) because they lack high-density plasma limitations. Applicant is erroneous for including canceled claim 9 in his grouping. Applicant is also erroneous for including claim 24 in his grouping because claim 24 recites "a method of forming a polymer ... said process further comprises: providing a high-density plasma etcher." Claim 24 includes high-density plasma limitations. Therefore, claims 7-8, 10-13, 19, 23, 36-38, and 40-43 receive the priority date of 06/02/95 for the great-grandparent application (paper #14: pg. 2, lines 13-14) because they lack high-density plasma limitations. ✓

The applicant's representative concluded that the rejections under §112 do not apply to claims 7-8, 10-13, 19, 23, 36-38, and 40-43. However, this point is moot because the priority is not considered back to 1995 and the §112 rejections were withdrawn in this instant Examiner's Answer.

The applicant's representative asserts, "that the examiner's admission regarding polymer formation indicates that those claims satisfy §112" (Appeals Brief: pg. 3, lines 19-20). The examiner has no understanding of this statement. The applicant did not overcome the §112 rejections. The §112 rejections were withdrawn because priority was not given back to 1995.

The applicant argues that the examiner's assumption regarding the grandparent's disclosure is incorrect. For clarification purposes, the examiner would like to clarify to the applicant's representative that the priority claims are referring to the great-grandparent's disclosure (08/458,861 - filed 06/02/95). The applicant pointed out two references to HDP in the great-grandparent. First, the applicant is overstating that

the great-grandparent's disclosure expressly refers to "high-density plasma" multiple times. The great-grandparent only refers to high-density plasma etchers twice. First on pg. 6, lines 13-14 and again on pg. 9, line 15. The great-grandparent briefly mentions HDP etchers twice in a 25-page specification. Second, the great-grandparent only mentions HDP etchers, not the method of forming a polymer using HDP. Third, the great-grandparent lists many types of plasma etchers such as a conventional plasma etcher, LAM TCP, or other such etcher (pg. 6, lines 12-13, 18-19). Fourth, the great-grandparent does not even proffer a best mode for apparatus part of the invention. Even if the 1995 specification read on a HDP etcher apparatus, the 1995 do not disclose polymer formation in a high-density plasma environment. Therefore, the process of forming a polymer in a high-density environment was not described or enabled in the 1995 specification.

The applicant argues that such "explicit references refute the examiner's basis for rejection." Two references to the HDP etcher are not explicit. The mention of HDP etcher apparatuses does not disclose the method of forming a polymer by HDP. Two references to HDP, not polymerization by HDP, is not sufficient for 1995 priority because high-density plasma apparatuses were well known in the art at the time of the 1995 application. However, HDP polymerization is different than high-density plasma. HDP polymerization was not known in the art until the end of 1996 (John Arnold, "Diagnostic Investigation of Oxide etching in a commercial high-density plasma etcher", The American Physical Society, 10/21/96). For the above reasons, the Board of Patent Appeals and Interferences should uphold the examiner's contention that the 1995

specification in the great-grandparent does not disclose or support forming a polymer in a high-density plasma environment found in this instant application. The Board of Patent Appeals and Interferences should uphold that the instant application does not have a 1995 priority date for claims 1-6, 14, 24, 29-32, 39.

B. 35 U.S.C. §102 rejections

Applicants' only argument is that the appealed claims are entitled to the benefit of the great-grandparent priority date of 6/02/95 and that the Arnold publication cannot serve as prior art. This point is moot because the appealed application is not entitled to the priority date of its great-grandparent. The great grandparent's specification does not disclose forming a polymer in high-density plasma.

First, the 1995 specification only refers to high-density plasma etchers twice in the entire 25-page specification. Second, high-density plasma etchers do not support a method of polymerization by HDP. Third, the 1995 specification lists other types of plasma etchers. Fourth, HDP polymerization is different than high-density plasma. Therefore, the process of forming a polymer in a high-density environment was not described or enabled in the 1995 specification. The Arnold publication is appropriate prior art.

C. 35 U.S.C. §103 rejections

Applicant's only argument is that the appealed claims are entitled to the benefit of the great-grandparent priority date of 6/02/95. Applicant asserts that the Arnold publication, Nulty '801, and Robles '259 cannot serve as prior art. ^{However} This point is moot

Robles is not prior art.

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because the appealed claims 1-6, 14, 24, 29-32, 39 are not entitled to the priority date of its great-grandparent.

The Board of Patent Appeals and Interferences should uphold the examiner's contention that the 1995 specification in the great-grandparent does not disclose or support forming a polymer in a high-density plasma environment found in this instant application for reasons found in the Examiner's Answer §§A-C. The instant application does not have a 1995 priority date for claims 1-6, 14, 24, 29-32, and 39. Therefore, the Arnold publication, ^{and} Nulty '801, ~~and Robles '259~~ are prior art.

D. Examiner's response from Paper #14

The applicant notes that on pg. 7, the examiner refers to a "101 rejection." This reference was a typo and should have stated "112 rejection." However, this point is moot because the 112 rejections are withdrawn.

Applicant's representative argues that the instant specification teaches a "layer of etch resistant material 22, such as a polymer is formed" (pg. 5, ln. 17-18; pg. 6, ln. 13-14). This point is moot because the examiner is not arguing that the instant specification fails to teach a polymer formed by HDP. The examiner has never raised this point regarding the instant application. The examiner will assume that the applicant is talking about the great-grandparent. This point is also moot because first, the 1995 specification only refers to high-density plasma etchers twice in the entire 25-page specification. Second, high-density plasma etchers do not support a method of polymerization by HDP. Third, the 1995 specification lists other types of plasma etchers. Fourth, HDP polymerization is different than high-density plasma. The great-

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grandparent's specification fails to teach a polymer formed by HDP. The instant specification does not gain priority back to 1995 for claims 1-6, 14, 24, 29-32, 39 because the great-grandparent lacks a disclosure of a polymer formed by HDP.

The applicant's representative argues that the text immediately surrounding these excerpts (pg. 5, ln. 17-18; pg. 6, ln. 13-14) addresses parameters for accomplishing the formation of the polymer. This point is moot for two reasons. First, the applicant fails to specifically point out which lines in the 1995 specification teach parameters for accomplishing the formation of the polymer. Second, the parameters of the etchers are for etching, not forming a polymer (pg. 6, lines 13-18).

E. Conclusion

The great-grandparent (filing date 06/02/1995) lacks sufficient description of the instant application. The appealed claims 1-6, 14, 24, 29-32, 39 of the instant application are not entitled to the priority date of its great-grandparent. The §102 and §103 rejections are proper as long as appealed claims 1-6, 14, 24, 29-32, 39 are not entitled to the priority date of its great-grandparent. The examiner's previous response to applicant's previous arguments does not fail for two reasons. First, the examiner applied new prior art in paper #14 and thus the applicant's previous arguments were moot in view of new rejections. Second, the examiner addressed priority issues in her response in paper #14. However, the applicant failed to be persuasive in showing how the 1995 specification supported polymer deposition by HDP. ~~An appeals conference~~ was held on 5/9/03 with Kamand Cuneo and Olik Chaudhari.

For the above reasons, it is believed that the rejections should be sustained.

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Respectfully submitted,

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